

Comment on 'Second-Order Statistical Structure of Geomagnetic Field Reversals' by P. S. Naidu

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In a recent paper, *Naidu* [1975] has proposed that the reversal intervals of the geomagnetic field for the period 0–76 m.y. are not independent. In fact, the author has fitted a first-order autoregressive moving average model to the data published by *Heirtzler et al.* [1968]. This conclusion, if true, is of importance because it suggests that the mechanism governing the reversals of the geomagnetic dynamo possesses a memory.

Naidu [1975] has developed his model on the basis of the exponential nature of the autocorrelation function calculated for the entire 76-m.y. data set. Implicit in this model is the assumption of stationarity during this time interval. However, *Naidu* [1971] himself has shown very clearly that the statistical structure of the polarity intervals underwent a marked transition about 48 m.y. ago. This fact has a pronounced effect on the computed autocorrelation function as demonstrated in Figure 1. It can clearly be seen that whereas the autocorrelation of the whole data set does exhibit an exponential form, the autocorrelation computed for the first 48-m.y. reversal history is impulsive at zero lag and demonstrates conclusively the independence of the intervals in this time

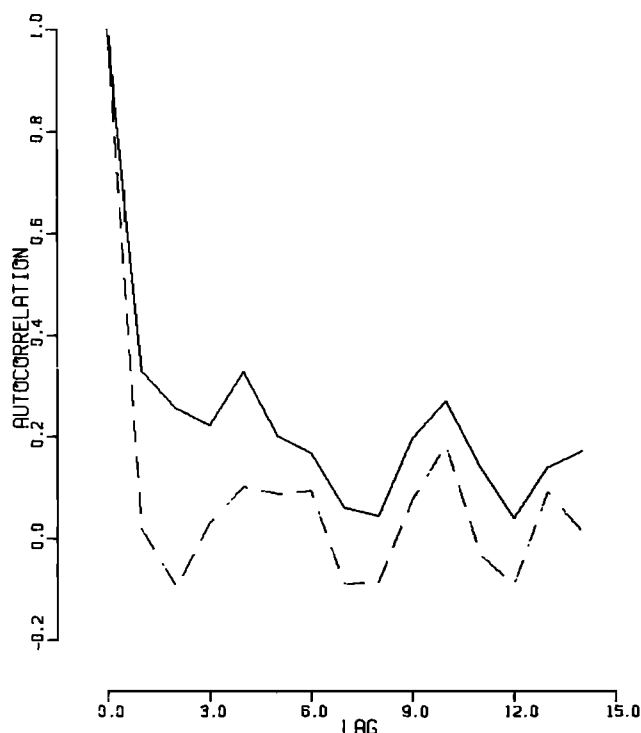


Fig. 1. Autocorrelation functions of polarity intervals. The solid line denotes the 0- to 72-m.y. segment, and the dashed line the 0- to 42-m.y. segment.

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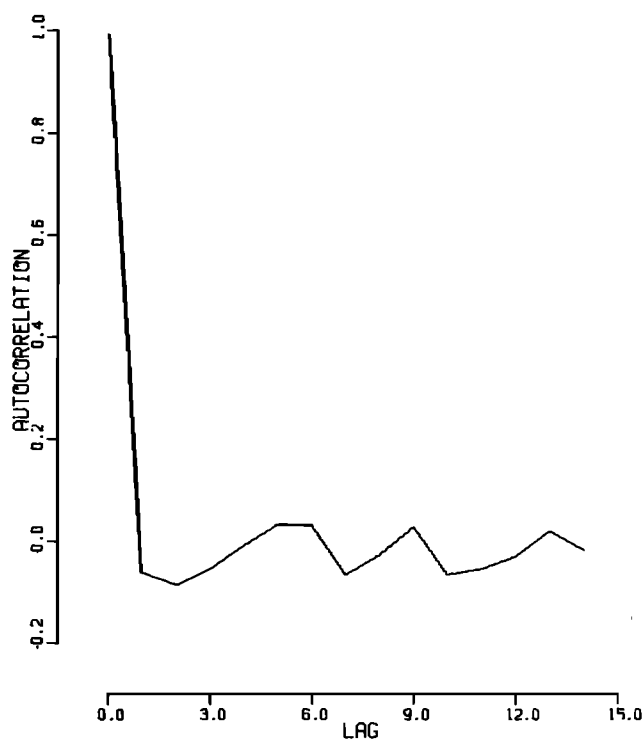


Fig. 2. Average autocorrelation function for the first six 8-m.y. segments.

span. In fact, each 8-m.y. history in the first 48 m.y. is composed of independent intervals. The average autocorrelation of the first six 8-m.y. segments is shown in Figure 2. Meaningful second-order statistical properties of the reversals from 48 to 76 m.y. are more difficult to determine because of paucity of data.

In summary, the reversal intervals for the first 48-m.y. history of the geomagnetic field are independent. The dependence suggested by *Naidu* [1975] is an artifact of the discontinuity in the statistical properties of the data at approximately 48 m.y.

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